Energy Efficiency Potential for Mitigating GHG Emissions: Findings from IPCC Fourth Assessment

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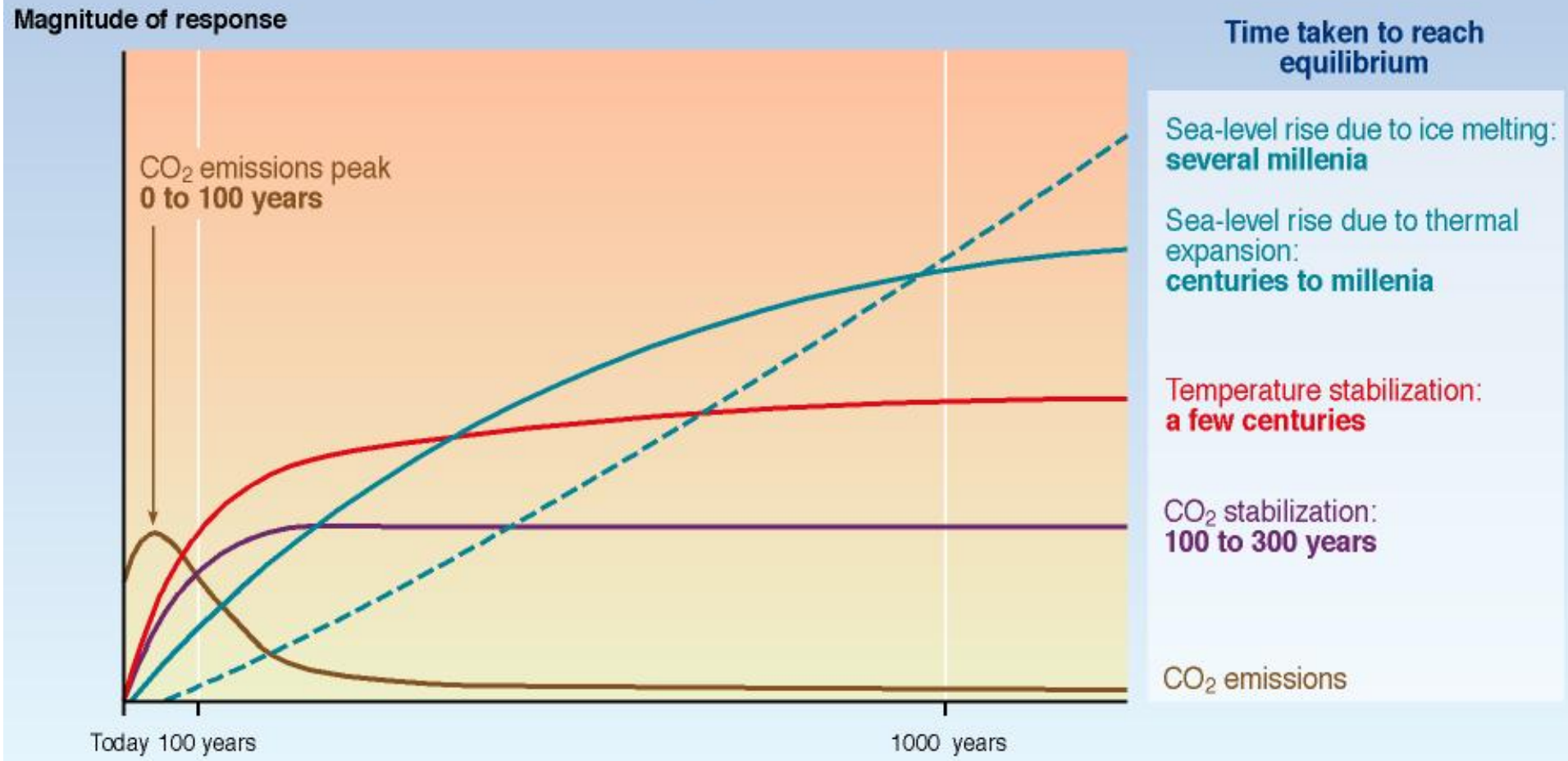
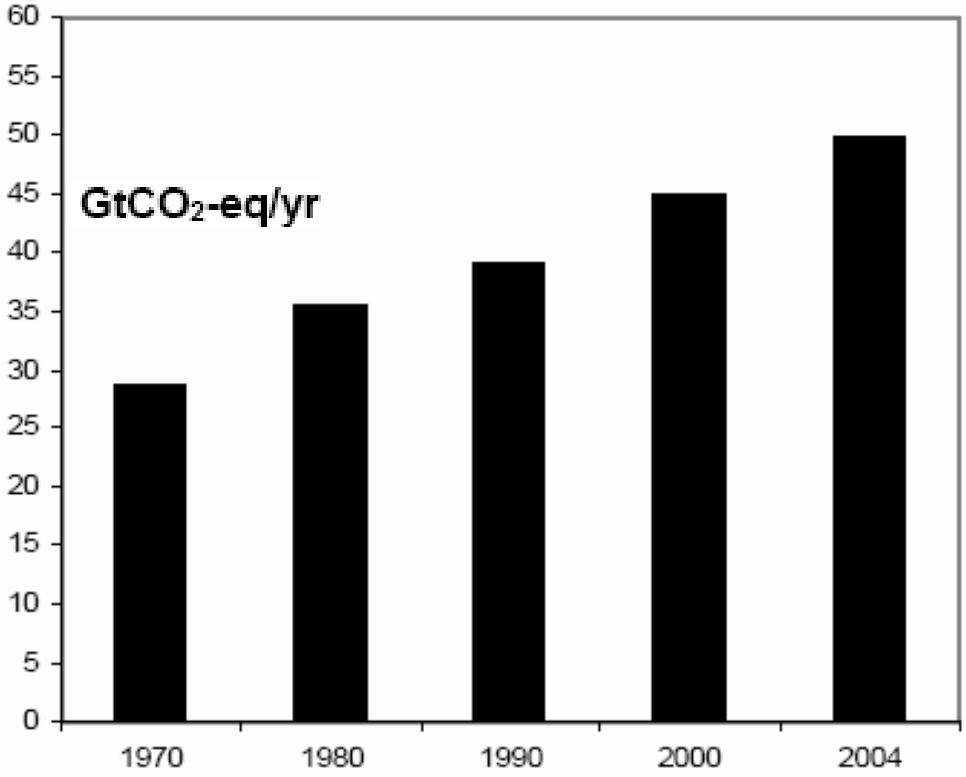
CO_2 concentration, temperature and sea level continue to rise long after emissions are reduced

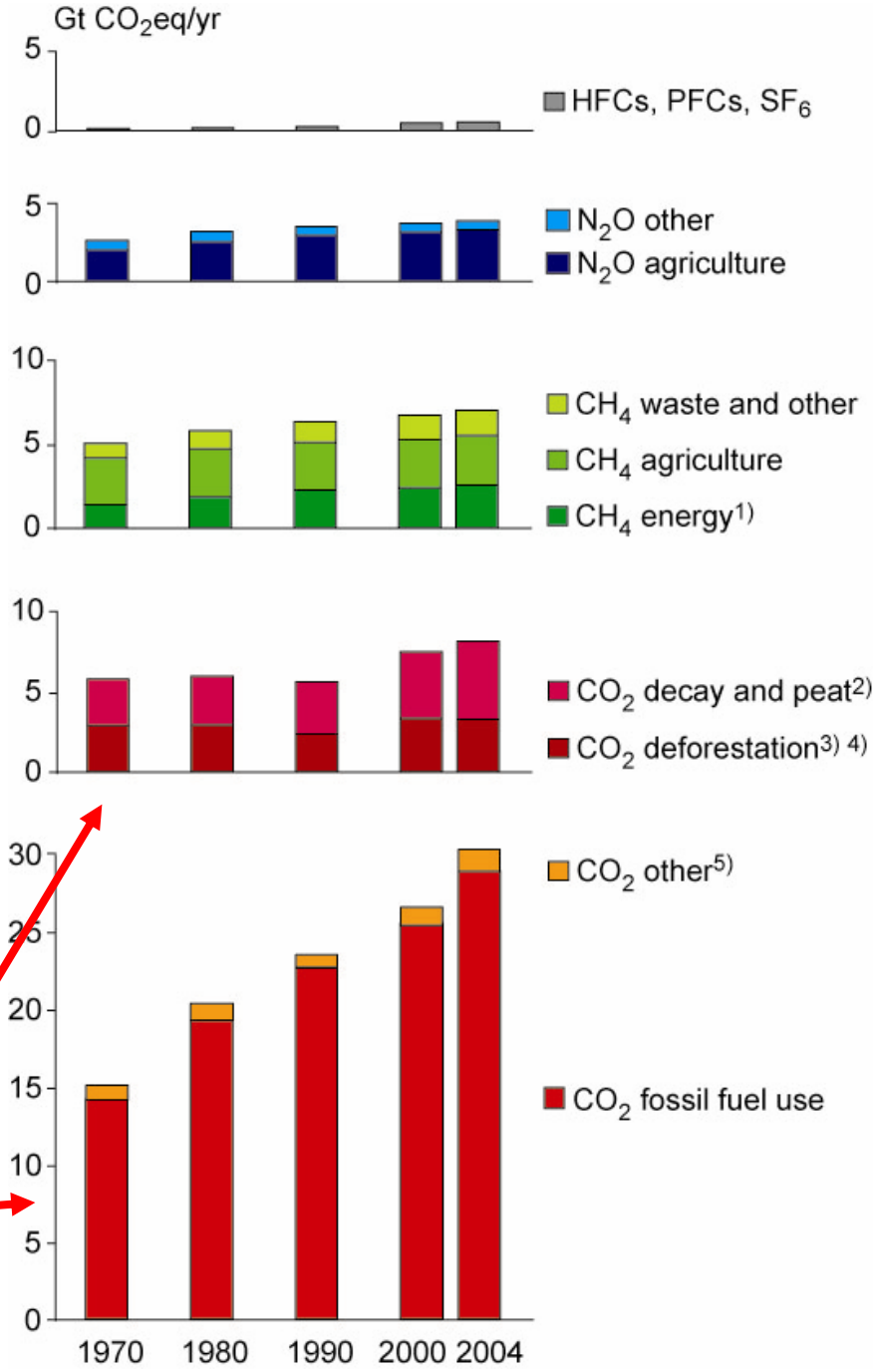


The People

- Lead Authors: 168
  - OECD countries, including US: 108
  - Developing countries: 55
  - EITs: 5
  - Contributing authors: 85
- Expert Reviewers: 485

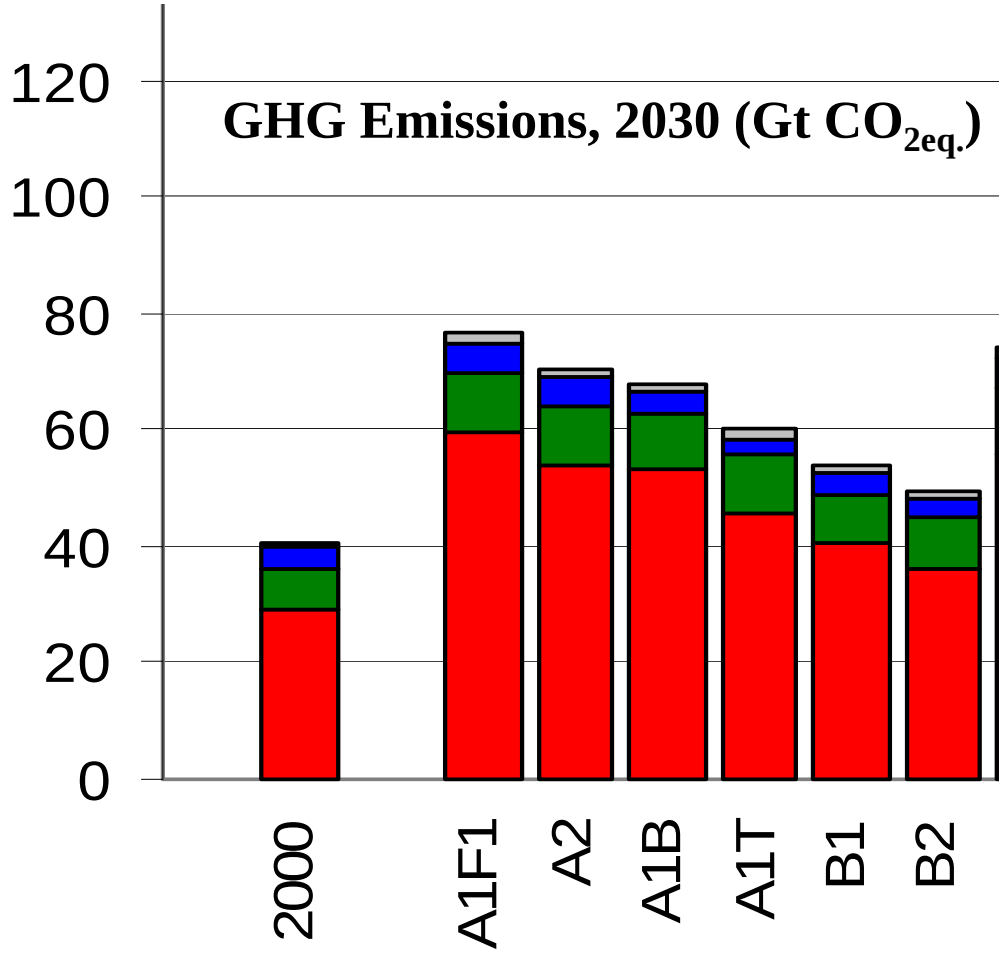
Total Global Greenhouse Gas Emissions Increased by 70 % (1970 – 2004)





Carbon Dioxide Is the Largest Contributor

IPCC Reference Scenarios Show that Global GHG Emissions Will Continue to Grow Because of Population and Economic Growth



How much can emissions be reduced and at what cost?

Mitigation Potentials and Costs

- ***Economic Potential*: *IPCC Analysis primarily reports this potential***
  - Takes into account social costs and benefits and social discount rates
  - Assumes that
    - market efficiency is improved by new policies and measures, and that
    - barriers are removed

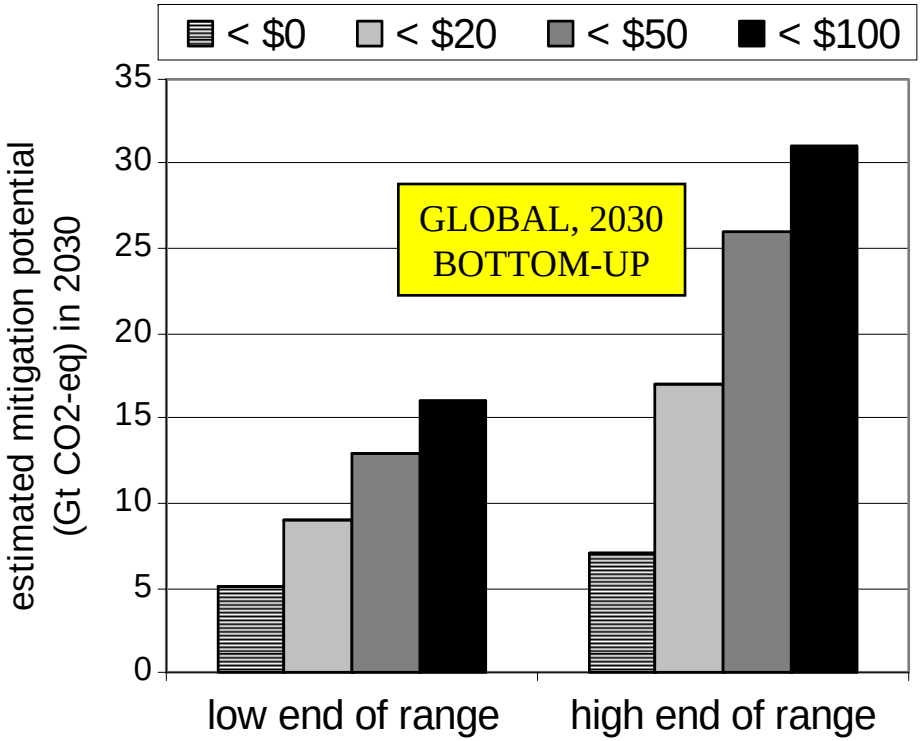
- ***Market Potential:***
  - based on private costs and private discount rates
  - expected to occur under forecast market conditions
  - including policies and measures currently in place
  - noting that barriers limit actual uptake

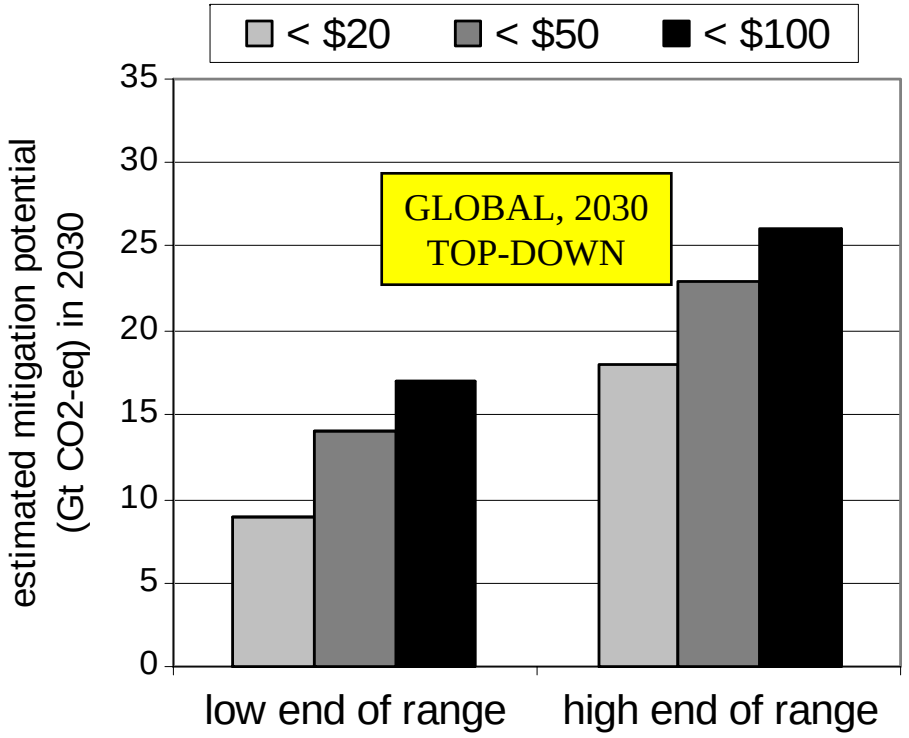
What does a carbon price of US$ 50/ tCO_{2eq} mean?

- Crude oil: ~US $25/barrel
- Gasoline: ~12 c/litre (50 c/gallon)
- Electricity:
  - from coal fired plant: ~5 c/kWh
  - from gas fired plant: ~1.5 c/kWh

Substantial Economic Potential for the Mitigation of Global GHG Emissions Over the Coming Decades

Potential could offset the projected growth of global emissions, or reduce emissions below current levels

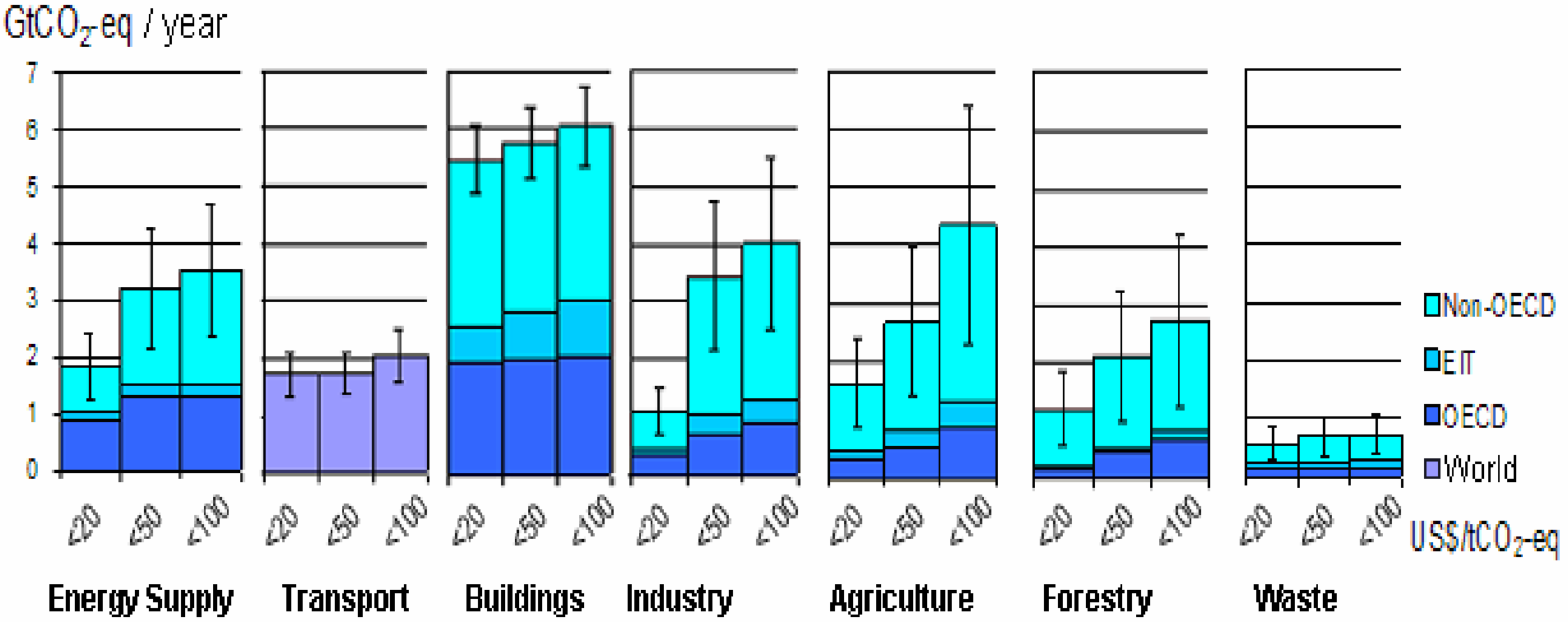




US Emissions 2005: 7.3 GtCO2eq

Note: Estimates do not explicitly include non-technical options such as lifestyle changes

All Sectors and Regions have the Potential to Contribute Largest Potential is in the Buildings Sector



Note:

- Sectoral estimates are based on bottom-up studies
- Estimates do not explicitly include non-technical options, such as lifestyle changes.

Changes in Lifestyle and Behaviour Patterns can Contribute to Climate Change Mitigation

- **Buildings:** Changes in occupant behaviour, cultural patterns and consumer technology choice and usage
- **Transport:** Reduction of car usage and efficient driving style, improved urban planning including public transport
- **Industry:** Staff training, regular feedback, reward systems, documentation of current practices can overcome organizational barriers

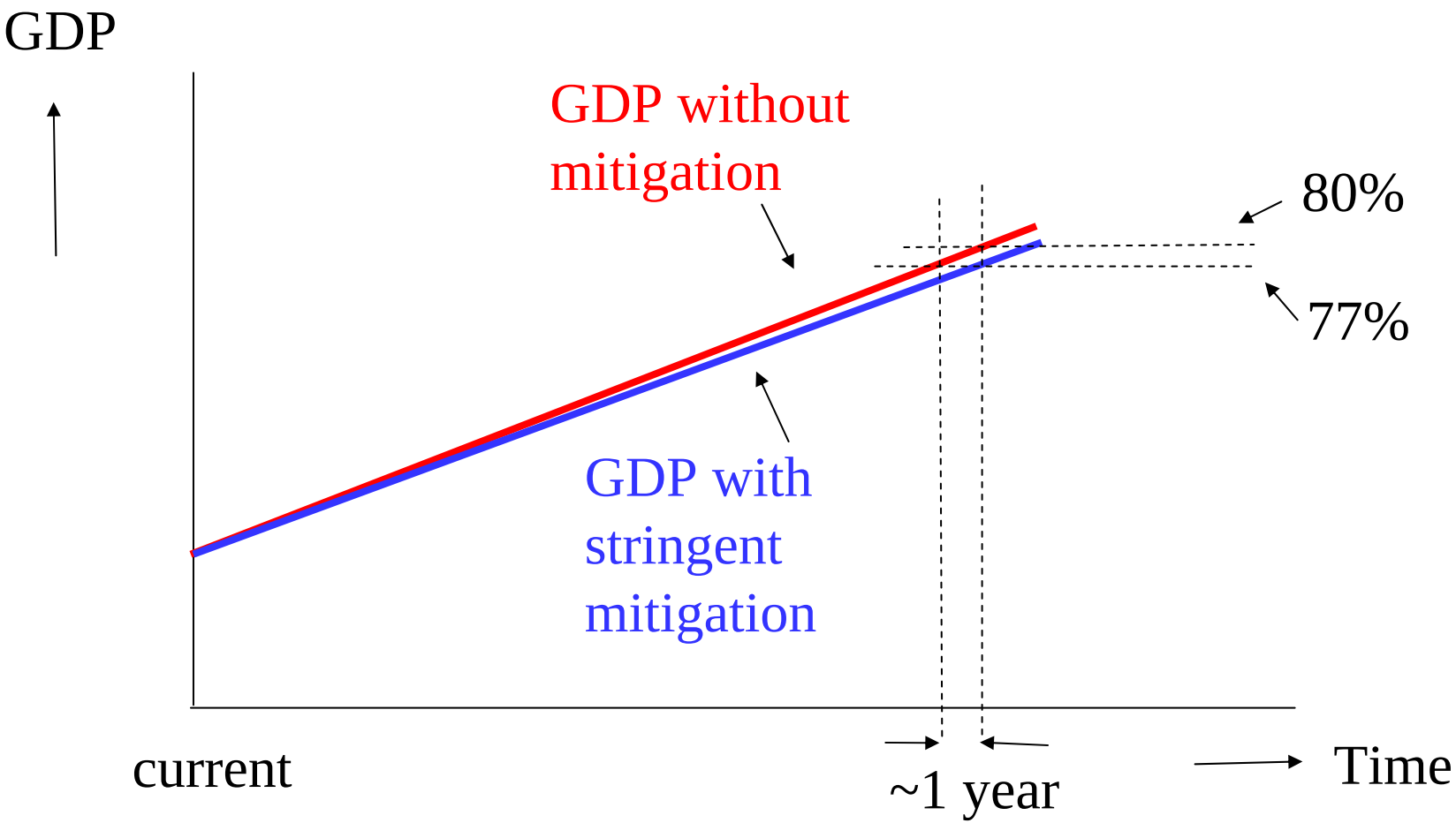
What are the Macroeconomic Costs in 2030?

- Costs are global average for least-cost approaches from top-down models
- Costs do not include co-benefits and avoided climate change damages

Trajectories towards stabilization levels (ppm CO_2-eq)	Median GDP reduction[1] (%)	Range of GDP reduction [2] (%)	Reduction of average annual GDP growth rates [3] (percentage points)
590-710	0.2	-0.6 – 1.2	< 0.06
535-590	0.6	0.2 – 2.5	<0.1
445-535[4]	Not available	< 3	< 0.12

[1] This is global GDP based market exchange rates
[2] The median and the 10th and 90th percentile range of the analyzed data are given
[3] The calculation of the reduction of the annual growth rate is based on the average reduction during the period till 2030 that would result in the indicated GDP decrease in 2030
[4] The number of studies that report GDP results is relatively small and they generally use low baselines

Illustration of cost numbers



Policies are Available to Governments to Realize Mitigation of Climate Change

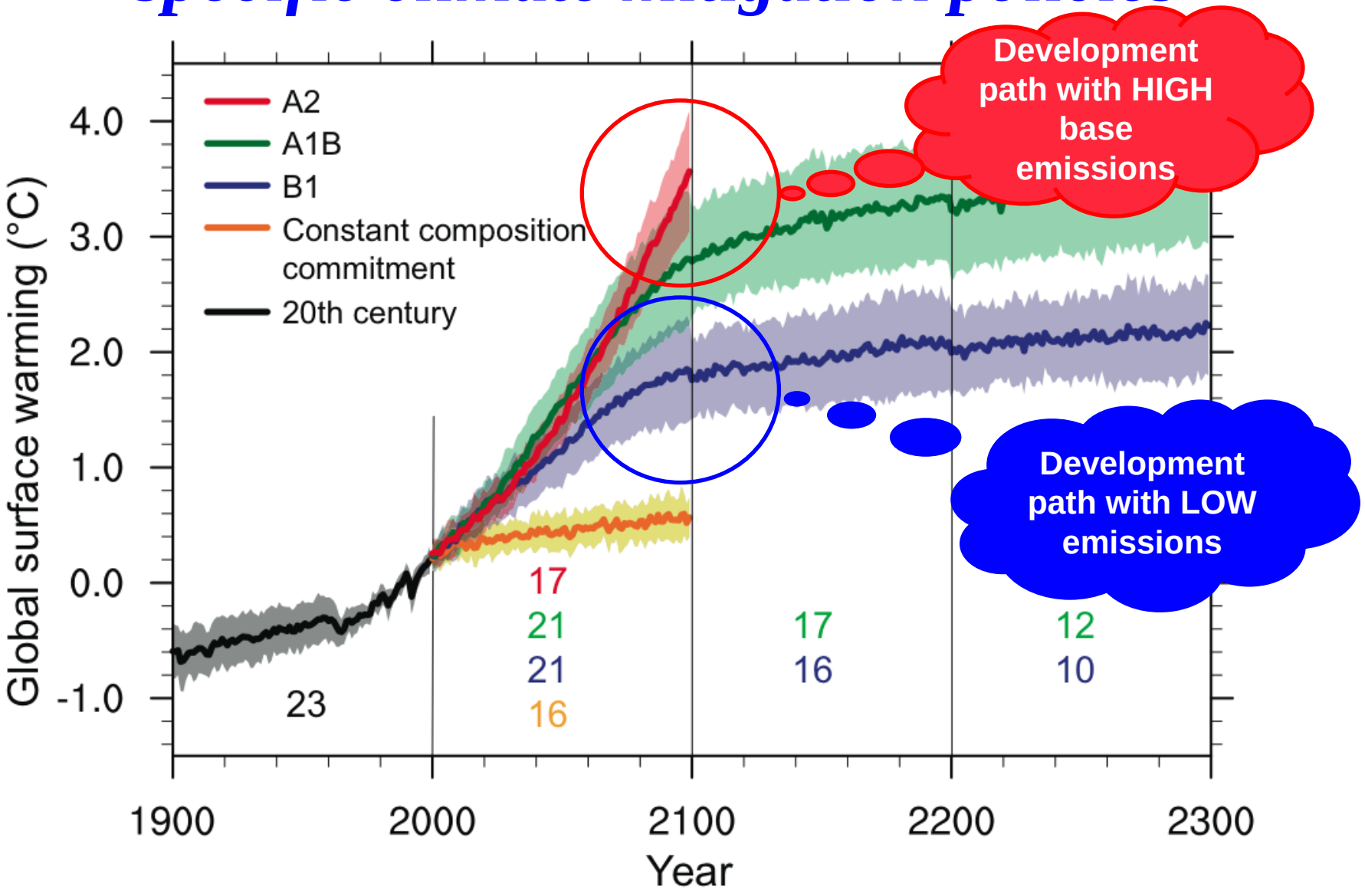
- *Regulations and standards* generally provide some certainty about emission levels. However, they may not induce innovations and more advanced technologies.
- *Taxes and charges* can set a price for carbon, but cannot guarantee a particular level of emissions. Literature identifies taxes as an efficient way of internalizing costs of GHG emissions.
- *Tradable permits* will establish a carbon price. Fluctuation in the price of carbon makes it difficult to estimate the total cost of complying with emission permits.
- *Financial incentives* (subsidies and tax credits) -- While economic costs are generally higher than for the instruments listed above, they are often critical to overcome barriers.
- *Voluntary agreements* between industry and governments are politically attractive, and raise awareness among stakeholders. The majority has not achieved significant emissions reductions beyond baseline. However, some recent agreements, in a few countries, have accelerated the application of best available technology and led to measurable emission reductions.
- *RD&D* can stimulate technological advances, reduce costs, and enable progress toward stabilization.

Market Failures May Block Pricing Signals and Favor Standards and Labels in Buildings Sector

- Recent US analysis[1] of the role of Principal Agent (PA) problem
  - Landlord-tenant and builder-buyer transactions
  - Tenant does not pay utility bills directly
  - Buyer does not have a choice of multiple appliances or HVAC systems with a range of first costs
- Results:
  - *% of households affected by PA problem*
  - Refrigerators – 33%
  - Space heating – 78%
  - Water heating – 53%
  - Lighting – 5%

1. Murtishaw and Sathaye, 2007
   Sathaye and Murtishaw, 2004

Development path as important as specific climate mitigation policies



Non-climate policies can influence GHG emissions as much as specific climate policies

Sectors	Non-climate policies -- Candidates for integrating climate concerns	Possible influence (% of global emissions)
Macro-economy	Taxes, subsidies, other fiscal policies	All GHG emissions (100 %)
Forestry	Forest protection, sustainable management	GHGs deforestation (7%)
Electricity	Renewable energy, demand management, decreasing losses transport,/distribution	Electricity sector emissions (20 %)
Oil-imports	Diversification energy sources/decrease intensity -> enhance energy security	GHGs from oil product imports (20 %)
Insurance buildings, infrastructure	Differentiated premiums, liability conditions, improved conditions green products	GHG emissions buildings, transport (20 %)
Bank lending	Strategy/policy, lending projects accounting for options emission limitations	Notably development projects (25%)
Rural energy	Policies promoting LPG, kerosene and electricity for cooking	Extra emissions over biomass (<2 %)

Conclusions

- Integrating climate mitigation in development decisions with climate consequences is essential for a low-emissions path to emerge
- Policies and technologies exist to achieve bulk of the near-term potential for emissions reduction
- Entities – state, markets, and civil society – at all levels need to participate in the mainstreaming process
  - National, state, and local governments,
  - Organized and unorganized industry,
  - Non-governmental organizations, and
  - General public

The IPCC Summaries for Policy Makers (SPMs) and the WGIII chapters can be downloaded from www.ipcc.ch

Thank you

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http://ies.lbl.gov